CONTENTS

Preface vii

Contents viii

Section I Boundary layer turbulence

Application of dynamical system theory to coherent structures in the wall region
N. Aubry, P. Holmes, J.L. Lumley and E. Stone 1

Boundary layer turbulence regarded as a driven linear system
M.T. Landahl 11

Noise induced intermittency in a model of a turbulent boundary layer
E. Stone and P. Holmes 20

Section II Cellular automata

Role of defects in the transition to turbulence via spatiotemporal intermittency
H. Chaté and P. Manneville 33

A lattice gas model with temperature
S. Chen, M. Lee, K.H. Zhao and G.D. Doolen 42

Spatiotemporal chaos in one- and two-dimensional coupled map lattices
K. Kaneko 60

Section III Spatio-temporal dynamical systems

The Newton transform: an operational method for constructing integrals of dynamical systems
S.A. Burns and J.I. Palmore 83

A form of turbulence associated with defects
P. Coullet, L. Gil and J. Lega 91

Observations of the fractal dimension of deep- and shallow-water ocean surface gravity waves
S. Elgar and G. Mayer-Kress 104

Chaotic behavior of an extended system
P.C. Hohenberg and B.I. Shraiman 109

A route to chaos and turbulence
S. Kida, M. Yamada and K. Ohkitani 116

Chaotic dynamics of coherent structures
L. Sirovich 126

Do inertial manifolds apply to turbulence?
R. Temam 146

Section IV Homogeneous turbulence

On the transition to turbulence in pipe flow
Y.-n. Huang and Y.-d. Huang 153

Is there a statistical mechanics of turbulence?
R.H. Kraichnan and S. Chen 160

Broken ergodicity and coherent structure in homogeneous turbulence
J.V. Shebalin 173

Non-solenoidal large scales in mean-incompressible turbulence
H.H. Shen 192

Strong decimation of the Betchov model of turbulence
T.T. Williams, E.R. Tracy and G. Vahala 200

Section V Plasma turbulence

Clouds and holes: self-organization in compressible fluid and collisionless plasma turbulence
H. Biglari and P.H. Diamond 206

MHD turbulence: relaxation processes and variational principles
D. Montgomery and L. Phillips 215

Section VI Shocks and interfacial instability

Statistical modeling of shock–interface interaction
D.C. Besnard, J.F. Haas and R.M. Rauenzahn 227

Growth induced by multiple shock waves normally incident on plane gaseous interfaces
M. Brouillette and B. Sturtevant 248

The interaction of a plane shock and a dense spherical inhomogeneity
N. Cowperthwaite 264

Modelling turbulent mixing by Rayleigh–Taylor instability
D.L. Youngs 270

Section VII Traveling waves and thermal convection

Traveling waves in axisymmetric convection: the role of sidewall conductivity
D. Barkley and L.S. Tuckerman 288

Traveling waves in nonequilibrium systems
M. Bestehorn, R. Friedrich and H. Haken 295

Nonlinear waves of the oscillatory instability on finite convective rolls
V. Croquette and H. Williams 300

Non-linear traveling wave states in finite geometries
M.C. Cross 315

Dynamics of traveling waves near the onset of convection in binary fluid mixtures
P. Kolodner, C.M. Surko and H. Williams 319

Flow structure transition mechanisms in thermal convection of air in rectangular containers
J.R. Leith 334

Mass transport in propagating patterns of convection
E. Moses and V. Steinberg 341

Pattern selection and transition to turbulence in propagating waves
V. Steinberg, J. Fineberg, E. Moses and I. Rehberg 359

Section VIII Two-dimensional hydrodynamics

On the hydrodynamics of soap films
Y. Couder, J.M. Chomaz and M. Rabaud 384

A liquid film (soap film) tunnel to study two-dimensional laminar and turbulent shear flows
M. Gharib and P. Derango 406

Steady-state simulation of 2D homogeneous turbulence
J. Lee 417

Section IX Vortices and vortex dynamics

Vortices, kinematics and chaos
H. Aref, S.W. Jones, S. Mofina and I. Zawadzki 423

Computation of vortex flows past obstacles with circulation
A.R. Elcrat and K.G. Miller 441

Dynamic analysis of vortex lifetime in 2D and 3D turbulence
X. He 453

Spiral vortex solution of Birkhoff–Rott equation
T. Kambe 463

Simulation of vortex reconnection
R.M. Kerr and F. Hussain 474

Transport properties of waves on a vortex filament
Y. Kimura 485

Three-dimensional interactions of vortex tubes
A. Leonard and K. Chua 490

Quasi-periodic dynamics of desingularized vortex models
C.C. Lim 497

Ultrasound as a probe of turbulence
F. Lund and C. Rojas 508

Laboratory study of the dynamics of Jovian-type vortices
S.D. Meyers, J. Sommeria and H.L. Swinney 515

Collapse of point vortex lattices
K.A. O'Neil 531

Simulations of incipient singularities in the 3D Euler equations
A. Pumir and E. Siggia 539

Two-time scale analysis of coherent vortex evolution in turbulence
P.W. Terry 542

Three-dimensional vortex tube reconnection: morphology for orthogonally-offset tubes
N.J. Zabusky and M.V. Melander 555

List of contributors 563

Analytic subject index 564